

AMENDMENTS TO THE CLAIMS

Claim 1. (Withdrawn): Apparatus for drilling holes in a material comprising,
a laser system that produces
a first laser beam for rapidly removing the bulk of material in an
area to form a ragged hole, and
a second laser beam for accurately cleaning up said ragged hole
so that the final hole has dimensions of high precision.

Claim 2. (Withdrawn): The apparatus of claim 1 wherein said first laser
beam is an infra-red laser beam.

Claim 3. (Withdrawn): The apparatus of claim 1 wherein said second laser
beam is a low power, short wavelength laser beam.

Claim 4. (Withdrawn): The apparatus of claim 1 wherein said first laser
beam is an infra-red laser beam and said second laser beam is a low power, short
wavelength laser beam.

Claim 5. (Withdrawn): The apparatus of claim 1 wherein said laser
system has an ablative mode for producing said first laser beam for rapidly
removing the bulk of material in an area to form a ragged hole.

Claim 6. (Withdrawn): The apparatus of claim 1 wherein said laser system
has a trepanning mode for producing said second laser beam for accurately cleaning
up said ragged hole so that the final hole has dimensions of high precision.

Claim 7. (Withdrawn): The apparatus of claim 1 wherein said laser system
has an ablative mode for producing said first laser beam for rapidly removing
the bulk of material in an area to form a ragged hole and a trepanning mode for
producing said second laser beam for accurately cleaning up said ragged hole so
that the final hole has dimensions of high precision.

Claim 8. (Withdrawn): The apparatus of claim 1 wherein said laser system comprises a single laser that produces said first laser beam and said second laser beam.

Claim 9. (Withdrawn): The apparatus of claim 1 wherein said laser system comprises a first laser that produces said first laser beam and a second laser that produces said second laser beam.

Claim 10. (Withdrawn): The apparatus of claim 1 wherein said laser system includes controls adapted to control first laser beam for rapidly removing the bulk of material in an area to form a ragged hole so that the final hole does not extend entirely through said material.

Claim 11. (Withdrawn): The apparatus of claim 10 wherein said controls are adapted to control first laser beam so that the final hole does not extend entirely through said material and said first laser beam leaves a thin membrane at the bottom of said hole.

Claim 12. (Withdrawn): The apparatus of claim 11 wherein said second laser beam breaks through said thin membrane at the bottom of said hole.

Claim 13. (Currently Amended): A method of drilling a hole in a material, said hole to have a final diameter, wherein said material has a back side and a second material is located at said back side, comprising: the steps of:

generating a first laser beam and generating a second laser beam,
said step of generating a first laser beam comprising generating a first high power percussive laser beam that has greater power than said second laser beam, said first high power percussive laser beam producing a first level of power and said first high power percussive laser beam being focused to a first high power percussive laser beam spot diameter that is slightly smaller than said final diameter of said hole,

directing said first high power percussive laser beam at said material to remove the bulk of said material to form a ragged hole having a diameter slightly smaller than said final diameter of said hole, said step of directing said first high power percussive laser beam at said material to remove the bulk of said material to form a ragged hole being accomplished by using said first high power percussive laser beam spot diameter to directly form said ragged hole without trepanning, said step of directing said first high power percussive laser beam at said material to remove the bulk of said material to form a ragged hole being stopped before said ragged hole reaches said back side and before said ragged hole reaches said second material thereby leaving a thin membrane of said material between said ragged hole and said second material.

said step of generating a second laser beam comprising generating a second and trepanning laser beam that has less power than said first laser beam, said second and trepanning laser beam producing a second level of power that is less than said first level of power and said second and trepanning laser beam having a spot diameter substantially smaller than said diameter of said hole, and directing and trepanning by tracing said second and trepanning laser beam along said diameter and at said hole being formed for expanding said ragged hole having a diameter slightly smaller than said final diameter of said hole so that said hole is at said final diameter and for accurately cleaning up said ragged hole so that said final hole has said final diameter and has dimensions of high precision and directing and trepanning said second and trepanning laser beam through said thin membrane of said material so that said final hole extends to said second material.

Claim 14. (Original): The method of drilling a hole in a material of claim 13 wherein said first laser beam is an infra-red laser beam.

Claim 15. (Original): The method of drilling a hole in a material of claim 13 wherein said second laser beam is a low power, short wavelength laser beam.

Claim 16. (Original): The method of claim 14 wherein said infra-red laser beam is produced by a laser operated in the ablative mode.

Claim 17. (Original): The method of claim 15 wherein said low power, short wavelength laser beam is produced by a laser operated in the trepanning mode.

Claim 18. (Original): The method of drilling a hole in a material of claim 13 wherein said first laser beam is an infra-red laser beam and said second laser beam is a low power, short wavelength laser beam.

Claim 19. (Previously Presented): The method of drilling a hole in a material of claim 13 wherein said second laser beam laser is focused to a spot a number of times smaller than the diameter of said ragged hole and said second laser beam is traced around the said ragged hole a multiplicity of times until there is little ragged material on the sides of said ragged hole.

Claim 20. (Previously Presented): The method of drilling a hole in a material of claim 19 wherein said second laser beam laser is focused to a spot from one to ten times smaller than the diameter of said ragged hole and is used to polish the sides of said hole to obtain high dimensional precision.

Claim 21. (Original): The method of drilling a hole in a material of claim 13 wherein said first laser beam is produced by a first laser and said second laser beam is produced by a second laser.

Claim 22. (Original): The method of drilling a hole in a material of claim 13 wherein said first laser beam and said second laser beam are produced by a single laser.

Claim 23. (Currently Amended): The method of drilling a hole in a material of claim 13 including using a laser to produce said first laser beam and

controlling said laser so that said first laser beam for rapidly removing the bulk of material in an area to form a ragged hole ~~so that the final hole~~ does not reach said backside and does not extend entirely through said material leaving a thin membrane of said material between said ragged hole and said second material.

Claim 24. (Currently Amended): The method of drilling a hole in a material of claim 23 including controlling said laser so that said first laser beam ~~so that~~ said ragged hole is stopped before it reaches said backside and so that the ~~final~~ ragged hole does not extend entirely through said material and said first laser beam leaves a thin membrane at the bottom of said hole between said ragged hole and said second material.

Claim 25. (Currently Amended): The method of drilling a hole in a material of claim 24 including controlling said second laser beam so that said second laser beam breaks through said thin membrane at the bottom of said hole so that said final hole extends to said second material.

Claim 26. (Withdrawn): A piece with a hole therein produced by the method of:

- generating a first laser beam,
- directing said first laser beam at said piece to remove the bulk of material in an area to form a ragged hole and begin forming said hole,
- generating a second laser beam, and
- directing said second laser beam at said hole being formed for accurately cleaning up said ragged hole so that said hole has dimensions of high precision.

Claim 27. (Withdrawn): The piece with a hole therein of claim 26 wherein said first laser beam is an infra-red laser beam.

Claim 28. (Withdrawn): The piece with a hole therein of claim 26 wherein said second laser beam is a low power, short wavelength laser beam.

Claim 29. (Withdrawn): The piece with a hole therein of claim 27 wherein said infra-red laser beam is produced by a laser operated in the ablative mode.

Claim 30. (Withdrawn): The piece with a hole therein of claim 28 wherein said low power, short wavelength laser beam is produced by a laser operated in the trepanning mode.

Claim 31. (Withdrawn): The piece with a hole therein of claim 26 wherein said first laser beam is an infra-red laser beam and said second laser beam is a low power, short wavelength laser beam.

Claim 32. (Withdrawn): The piece with a hole therein of claim 26 including the step of controlling said first laser beam for rapidly removing the bulk of material in an area to form a ragged hole so that the final hole does not extend entirely through said material.

Claim 33. (Withdrawn): The piece with a hole therein of claim 32 including the step of controlling said first laser beam so that the final hole does not extend entirely through said material and said first laser beam leaves a thin membrane at the bottom of said hole.

Claim 34. (Withdrawn): The method of drilling a hole in a material of claim 33 including the step of controlling said second laser beam so that said second laser beam breaks through said thin membrane at the bottom of said hole.